

PREDICTING E-LEARNING APPLICATION IN AGRICULTURAL HIGHER EDUCATION USING TECHNOLOGY ACCEPTANCE MODEL

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ABSTRACT

E-learning is significant breakthrough in teaching and learning. Internet or web technologies are important because they facilitate and enhance communications among instructors and learners and provide tools to encourage creativity and initiative. If internet-based learning environments are to benefit students, then it is important from the student's perspective that they are not seen as overly complex and hard to use. The introduction of e-learning may hinder the learning process if the technology is perceived as being complex and not useful to enhanced performance, and thus a distraction to learning. In line with acceptance studies, this research proposed and tested students' acceptance behavior of agricultural higher education for application of e-learning using technology acceptance model. Results demonstrated that there was positive relationship between students' intention to use e-learning and its perceived usefulness, internet experience, computer self-efficacy and affect. Instead computer anxiety and age had negative relationship with students' intention to use e-learning.

Keywords: E-Learning; agricultural higher education; technology acceptance model (TAM); computer anxiety; computer self-efficacy; affect.

INTRODUCTION

Advances in computing and information technologies are changing the way people meet and communicate. People can meet, talk, and work together outside traditional meeting and office spaces. Information technology is also dramatically affecting the way people teach and learn (Delacey and Leonard, 2002; Radcliffe, 2002; Starr, 1997).

E-learning, a new approach in education, is "the appropriate organization of information and communication technologies, for advancing student-oriented, active, open, and life-long teaching-learning processes" (Thurab-Nkhosi, 2003). E-learning was born during the dot-com frenzy, and the term "e-learning" was not well known until a few years ago. But now the term is common, especially in the university community (Bose, 2003). E-learning in Iran is still in its infancy stages and there are only a few online programs although it is a necessity for Iran rather than convenience owing to shortage of higher education institutions and enormous demand for education. Faculties of agriculture have not delivered any online program, but students should select their courses electronically by using faculty enrolment system. Although students of agriculture have not passed any online courses, but they do many activities via internet, for example they communicate with their teachers and other students and complete their assignments and homework. In other words, e-learning as a type of education has not been used in agricultural higher education, but students use internet and e-learning tools very much for doing their daily tasks. As new information technologies infiltrate workplace, home, and classrooms, research on user acceptance of new technologies has started to receive much attention from professionals as well as academic researchers. User acceptance is defined as "the demonstrable willingness within a user group to employ information technology for the tasks it is designed to support" (Dillon & Morris, 1996). Although this definition focuses on planned and intended uses of technology, studies report that individual perceptions of information technologies are likely to be influenced by the objective characteristics of technology. For example, the extent to which one evaluates new technology as useful, she/he is likely to use it (Rogers, 1986; Trevino, Lengel, and Daft, 1987). Of the suite of theories that explain technology acceptance, technology acceptance model appears to be the most widely accepted theory among information systems research for studying users' system acceptance behavior (Liu et al., 2005). TAM was adapted from well-known theory of reasoned action (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975) which is framework used extensively for predicting and explaining a variety of human behaviors. TAM, proposed by Davis et al. (1989) and shown in Fig.1, Modified theory of reasoned action to predict computer adoption by replacing the belief determinants of theory of reasoned action with two key beliefs: *perceived usefulness* (the belief that use of a particular technology will improve one's performance) and *perceived ease of use* (the belief that using technology will be effortless). Further, in the model of Davis et al., perceived ease of use directly affects perceived usefulness, with both of the use beliefs affecting computer technology adoption (Pituch & Lee, 2004). Davis et al. have also suggested that external factors may be important determinants of the usefulness constructs of TAM. In this study, we investigated external factors that may affect intention to use e-learning by graduate students of agriculture in University of Tehran. The variables that studied in this research were as following:

Internet Experiences

Based on related researches, learners' prior technical skills in using the internet may affect intention to use e-learning. For example, prior computer experience has been found to influence intent to use a variety of technology applications including microcomputers and internet banking services (Igarria et al., 1995; Tan and Teo, 2000), as well as distance education (Kerka, 1999).

Computer Anxiety

Computer anxiety is a concept-specific anxiety, because it is a feeling that is associated with a person's interaction with computers (Saade & Kira, 2006). In fact, Howard and Smith (1986) define computer anxiety as the tendency of a person to experience a level of uneasiness over his or her impending use of a computer.

Computer Self-efficacy

Self-efficacy reflects one's beliefs about the ability to perform certain tasks successfully (Pituch & Lee, 2004). Computer self-efficacy examines users' beliefs regarding their ability to perform specific tasks using a software package (Dishaw et al., 2002).

Affect

The term "affect" consists of four dimensions: cognitive, affective, behavioral and perceived control (Saade and Kira, 2006). In this study we consider the affective component. Affective refers to an individual's feelings of joy, elation, pleasure, depression, distaste, discontentment, or hatred with respect to a particular behavior (Triandis, 1980). Positive affect towards a learning tool leads to gaining experience, knowledge and self-efficacy regarding usage, and negative affect causes students to avoid e-learning (Arkkelin, 2003).

Age

Past studies have examined the effect of individual differences on behavioral intention (Agarwal and Prasad, 1999; Burton-Jones & Hubona, 2003; Venkatesh et al., 2003). In line with these studies, we investigated age of students as a variable that may affect students' belief. The research presented here was guided and motivated by one specific question: *how an e-learning system can become successful in agricultural higher education?* Initial findings suggest that the TAM measures of perceived usefulness and perceived ease of use are effective predictors of systems success (Behrens et al., 2005).

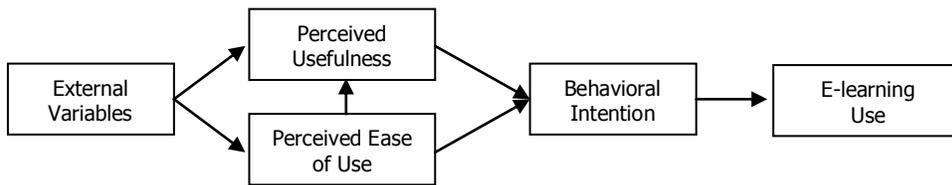


Figure: 1 The technology acceptance model (Pituch & Lee, 2004)

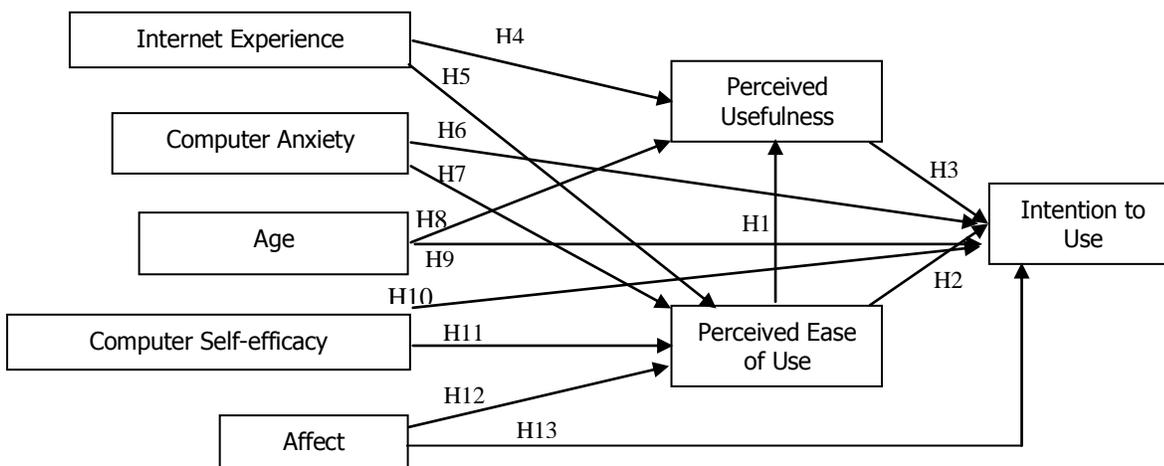


Figure: 2 Research Model

THE RESEARCH MODEL

Above Figure: 2 shows the Research Model to be empirically tested in this study. This model was constructed to answer the research question raised earlier and was derived from the theories described in the previous section.

In this research, we measured behavioral intention to use e-learning instead of actual use of e-learning, because there was no e-learning system that students could apply in faculty of agriculture. Actual behavior and intention have been found to be highly correlated (Davis, 1985; Ajzen and Fishbein, 1980).

Hypotheses

A series of testable hypotheses can be developed from the proposed research model, as shown below:

- H1: perceived ease of use will have a positive relationship with perceived usefulness.
- H2: perceived ease of use will have a positive relationship with intention to use e-learning.
- H3: perceived usefulness will have a positive relationship with intention to use e-learning.
- H4: Internet experience will have a positive relationship with perceived usefulness.
- H5: Internet experience will have a positive relationship with perceived ease of use.
- H6: Computer anxiety will have a negative relationship with intention to use e-learning.
- H7: Computer anxiety will have a negative relationship with perceived ease of use.
- H8: Age will have a negative relationship with perceived usefulness.
- H9: Age will have a negative relationship with intention to use e-learning.
- H10: Computer self-efficacy will have a positive relationship with intention to use e-learning.
- H11: Computer self-efficacy will have a positive relationship with perceived ease of use.
- H12: Affect will have a positive relationship with perceived ease of use.
- H13: Affect will have a positive relationship with intention to use e-learning.

METHODOLOGY

Participants of the current study were graduate students of agriculture in university of Tehran. We selected our target group by purposive sampling. In this sampling plan, sample elements are selected because they are believed to be representatives of the population of interest and are expected to serve the research purpose of this study (Churchill, 1991). We elected those students that are using email regularly and utilized faculty enrolment system at least twice. So, 120 students (M.Sc. and PhD) were selected as a sample of this research. The questionnaire used for data collection contained scales to measure the various constructs depicted in the research model.

The scales for perceived usefulness, perceived ease of use, behavioral intentions, computer anxiety, computer self-efficacy and affect were adapted from prior studies, many of which have already established their reliability and validity (Davis, 1989; Davis

et al., 1989; Mathieson, 1991; Moore and Benbasat, 1991; Taylor and Todd, 1995; Venkatesh & Davis, 1996; Dishaw et al., 2002; Bourton-Jones and Hubona, 2003; Liu et al., 2005; Saade & Kira, 2006).

To test the research hypotheses, we ran a path analysis based on a series of regressions using SPSS software. In the path analysis, we regressed each variable in turn onto the set of variables preceding it in the model. For example, when testing the possible influence of external variables on perceived ease of use, a regression analysis was performed predicting perceived ease of use from internet experience, computer anxiety, computer self-efficacy and affect. When determining the influence of external variables and perceived ease of use on perceived usefulness, a regression analysis was performed predicting perceived usefulness from internet experience, computer anxiety, computer self-efficacy, age, affect and perceived ease of use. By repeating these types of regressions, we created an output path diagram by drawing an arrow for each significant relation.

FINDINGS

Table: 1 summarizes descriptive statistics for variables used in the analysis, including the number of respondents for each measure. Note that each scale is based on a Five-Likert scale. All variables showed positive mean values. These loading should be higher than 0.5, following the criterion indicated by Pedersen and Nysveen (2003) to indicate that significant variance was shared between each item and construct.

It is expected that the loadings of all items within a construct should be high on that construct, indicating high convergent validity, and low on the others. The factors were extracted using the principal components method (Varimax rotation) which is an optimum approach to consideration prior to rotation.

Table: 1
Descriptive Statistics for Main Variables

Variable	Number	Mean	Std. Dev.
Perceived Ease of Use(PEU)	120	3.52	1.08
Perceived Usefulness(PU)	120	3.90	1.16
Computer Anxiety(CAN)	119	3.77	1.10
Internet Experience	116	2.90	1.58
Computer Self-efficacy(CSE)	120	3.41	0.15
Intention to Use(ITU)	120	2.90	0.79
Affect(AFF)	120	3.55	1.05
Age	119	29.02	5.70

Table: 2 Shows reliabilities of individual items which were assessed by examining the loadings of the items on their respective constructs.

Table: 2 clearly show that the six-factor solution is appropriate and the items display desirable convergent and discriminant validity. In specific, table 2 highlights the values higher than 0.5, thereby indicating that the items used for the specific construct belong together and measure the same variable.

For example, if we consider PEU, we find that PEU4 loads low with respect to PEU1, PEU2 and PEU3 but can still be accepted based on the criteria explained above.

Table: 2
Factor Analysis

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
PEU1	.864					
PEU2	.850					
PEU3	.818					
PEU4	.536					
PU1		.863				
PU2		.820				
PU3		.802				
PU4		.708				
CAN1			.807			
CAN2			.800			
CAN3			.761			
CAN4			.680			
AFF1				.763		
AFF2				.686		
AFF3				.563		
AFF4				.561		
CSE1					.817	
CSE2					.702	
CSE3					.558	
CSE4					.527	
ITU1						.672
ITU2						.620
ITU3						.583

Figure 3 illustrates the results of the path analysis. Each arrow (except for dotted arrows) in the diagram represents a statistically significant relationship ($p < .05$) between variables. Note that computer self-efficacy (H11), computer anxiety (H7), affect (H12) and internet experience (H5) did not produce significant relationship with perceived ease of use. In this manner, age did not have significant relationship with perceived usefulness (H8). In this study, one of the original TAM hypotheses (H3) was supported. We found a strong direct influence of perceived usefulness on students' intention to use e-learning. However, of the ten hypotheses developed for the extended TAM, H5, H7, H8, H11 and H12 were not supported.

The relationship between age of students and their intention to use e-learning (H9) was negative. It seemed that students' intention to use e-learning have decreased as their age increased.

Morris and Venkatesh (2000) argued that age increases the effect of subjective norms due to older students' greater need for affiliation. Literature also suggests that habits can become stronger as one grows older because routines become difficult to change (Harrison & Rainer, 1992; Majchrzak & Cotton, 1988; Nickel & Pinto, 1986). Many older students lack the level of computer skills of younger classmates. So, these students find it more difficult to learn and use e-learning system.

Students had positive affect towards use of e-learning system (H13), but the influence of computer anxiety on students' intention was in opposite direction (H6). In other

words, more computer anxiety is the lower intention to apply e-learning system. So, this concept of "I like it but I am anxious" shows that educational designers should consider the use of an e-learning system within an instructional and pedagogical setting.

Internet experience had indirect influences on the tendency of students to use e-learning system. Those students that had high experience in the context of internet will see more potential uses of the tool as they become more experienced, and thus should also perceive e-learning system as more useful. Prior researches have indicated that self-efficacy influences performance or behavior (Compeau & Higgins, 1995; Compeau, Higgins and Huff, 1999; Taylor & Todd, 1995), including behavioral intention (Tan & Teo, 2000; Venkatesh, 1999), and other studies have found that computer self-efficacy and perceived ease of use are related (Davis, 1989; Venkatesh & Davis, 1996). Further, Lim (2000) found that computer self-efficacy influences participation of adult learners in web-based distance education. Our research confirmed this hypothesis (H10) and showed that students' intention to use e-learning and their computer self-efficacy was highly correlated.

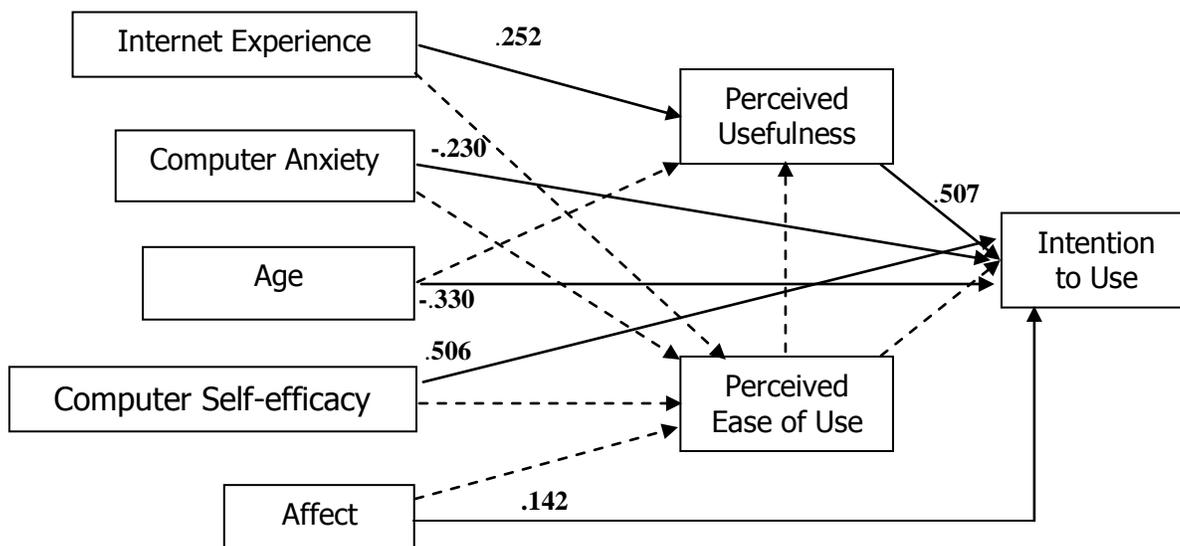


Figure: 3
Path Analysis Results

CONCLUSION

The objective of this research was to contribute to the acceptance of e-learning in agricultural higher education institutions. One of the strongest theories, TAM, has been shown to be a valid and powerful model in past studies. Drawing on a recent review of TAM research, this paper investigated external variables that have influenced students' perspectives. Based on established theory and empirical research, this study proposed and validated a research model that demonstrated the importance of specific external variables in students' intention to use e-learning. Results showed that perceived usefulness, internet experience, computer self-efficacy and affect had positive relationship with students' intention to use e-learning system. Instead, computer anxiety and age had negative relationship with students' intention to use e-learning.

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